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FINAL REPORT TO ONR

Grant #N00014-92-J-1205: KERE Hydrographic/Tracer Studies

PI: Alan M. Shiller, Center for Marine Science, University of Southern Mississippi

This project involved making a closely-spaced hydrographic section across the Kuroshio near the point where it departs from the Japanese coast. The survey was made in July 1992 with 18 stations occupied on a line extending from 37°N, 142°E to 33°N, 144°E. Water samples were analyzed for O_2, SiO_2, NO_3, and PO_4 and a CTD provided T and S. A detailed analysis has been made of these sections. Following is a summary of our conclusions:

a) Volume transport of the Kuroshio (based on geostrophic calculations) was 81 Sv, which compares well with previous estimates.

b) Vertical mixing processes beneath the Kuroshio frontal zone can bring intermediate depth waters to the near surface. The patchy nature of this water suggests that the vertical mixing is not continuous. If this mixing is the result of upwelling due to divergence associated with the anticyclonic turning of the Kuroshio, then changes in the meandering may explain its apparent intermittence.

c) Lateral mixing of intermediate waters across the section also appears to be patchy as evidenced by considerable isopycnal variability in temperature and salinity.

d) A south-flowing deep western boundary current is observed at intermediate depth in this section (based on silica anomalies and dynamic properties). This observation is consistent with observations by others to the north of the KERE section.

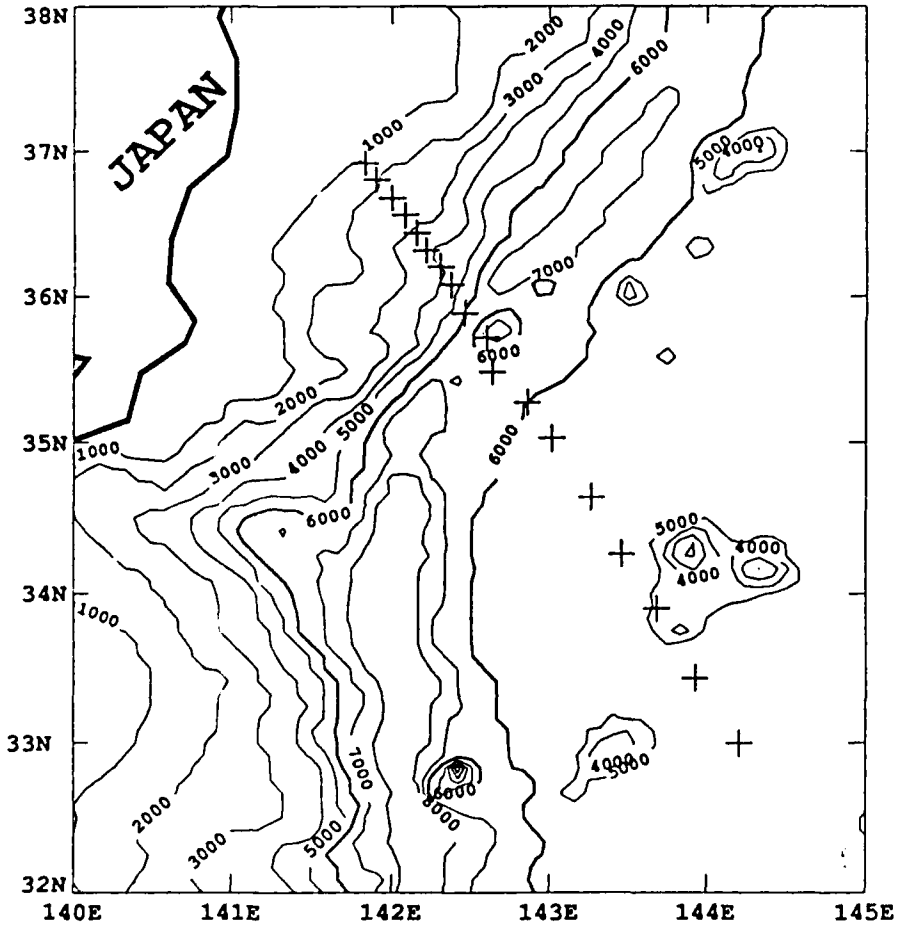
e) A north-flowing abyssal current is observed associated with the Japan Trench. This observation is consistent with previous observations by others both north and south of the KERE section.

f) There is a dynamic interaction between the Kuroshio and the Kashima 1 Seamount (which rises to ~4000 m from the Japan Trench). The Kuroshio appears to depress isopleths over the seamount (presumably affecting the abyssal current); while the seamount results in a doming of the isotachs of the Kuroshio.

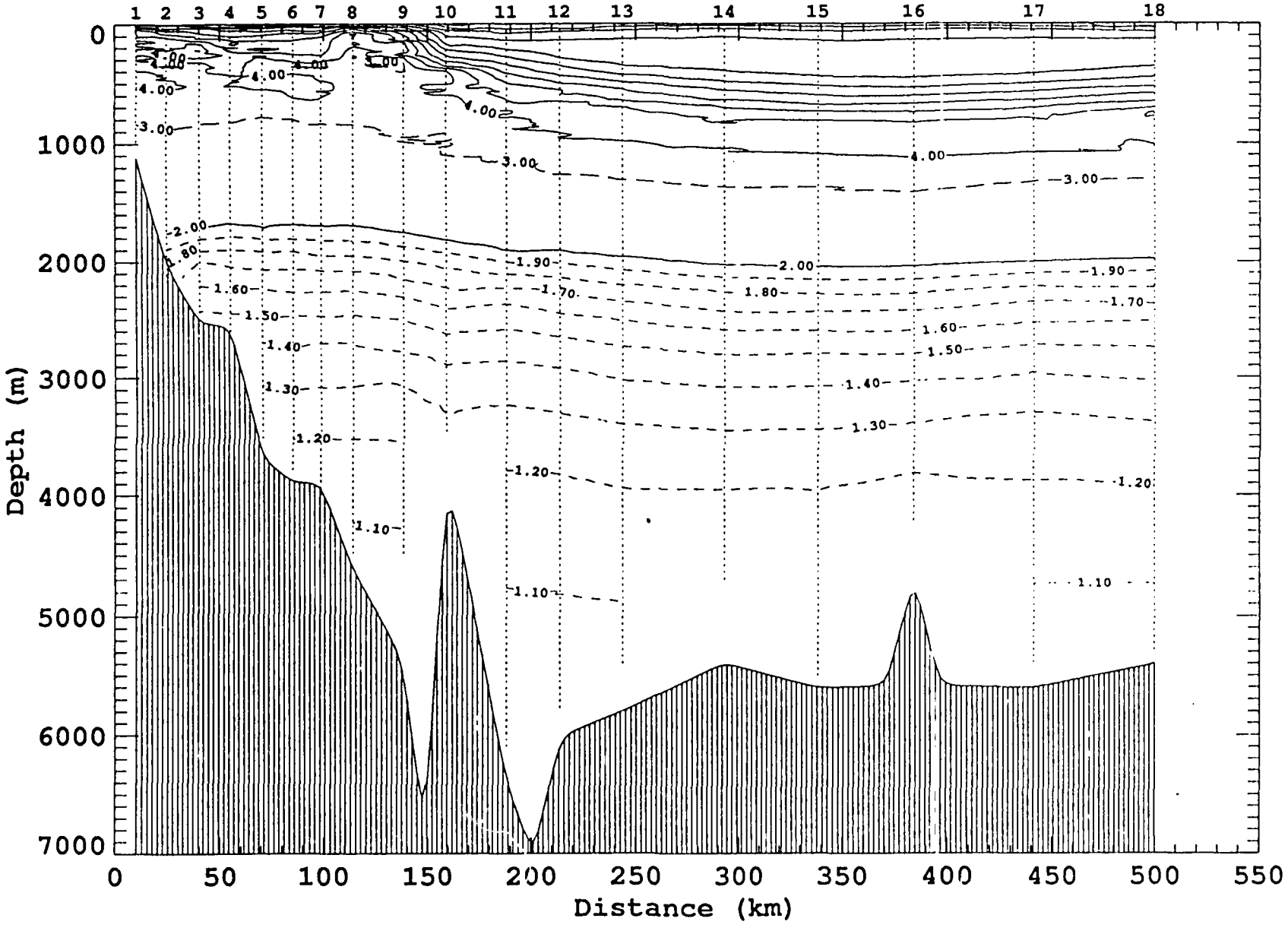
We note that if a coarser, more traditional spacing of the hydrographic stations had been used, much of the detail which led to the above conclusions would have been missed.

During the cruise moored instrumentation and drifters were deployed as part of other aspects of the KERE field program. Data from those instruments will help quantify the observations described here.

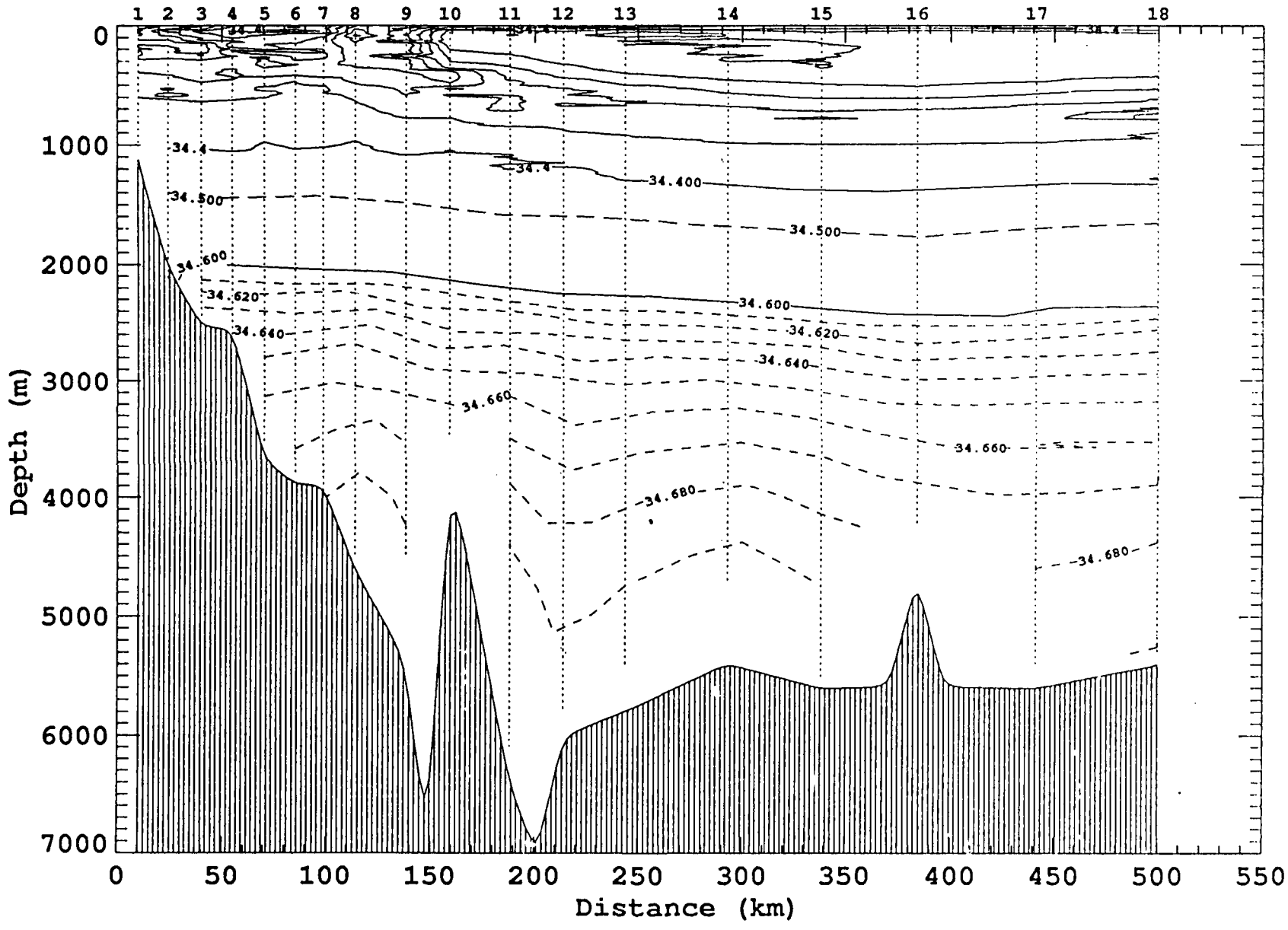
Attached are copies of the sections.


JAPAN
38N
37N
36N
35N
34N
33N
32N
140E
141E
142E
143E
144E
145E
1000
2000
3000
4000
5000
6000
7000

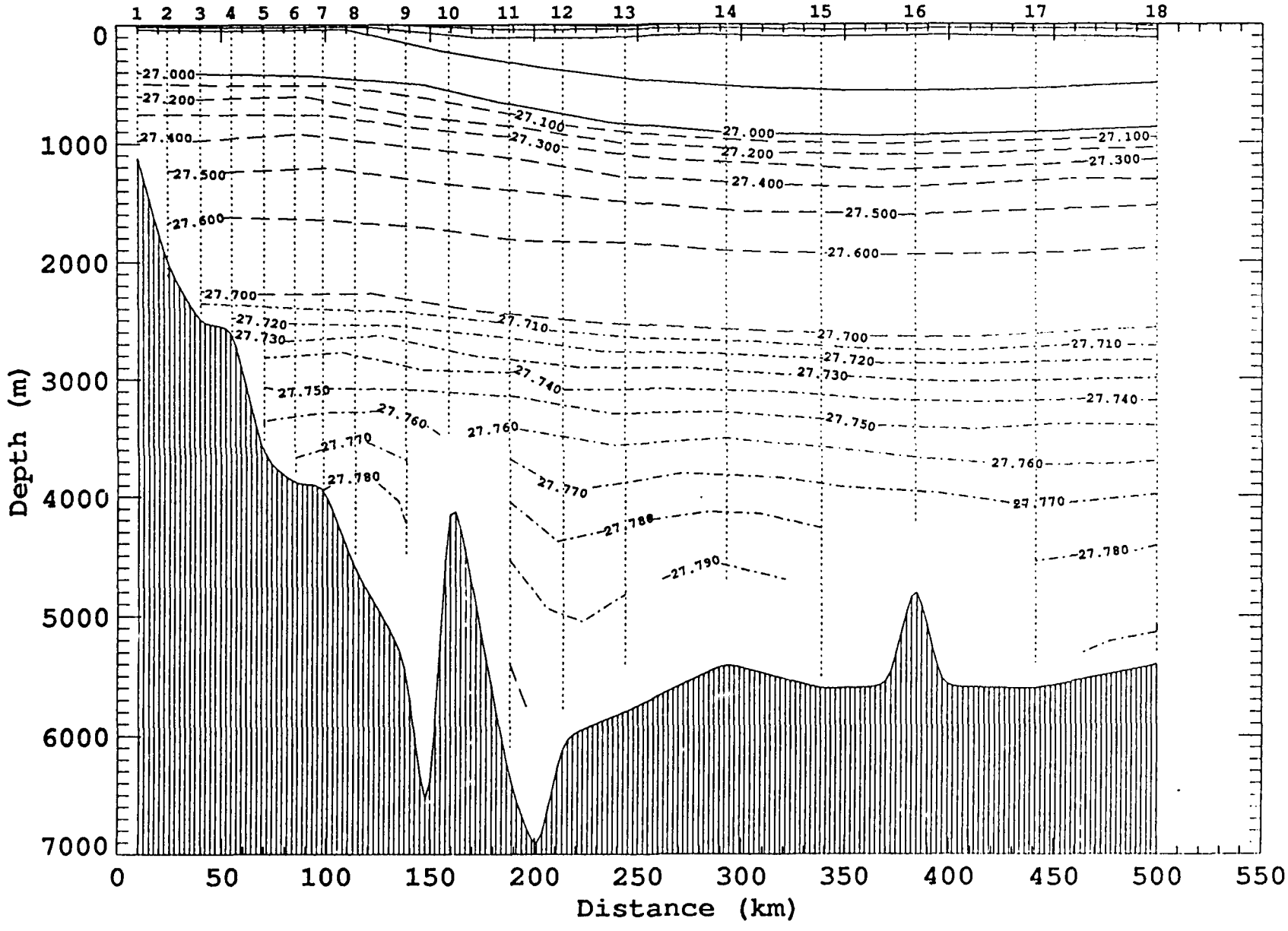
POTENTIAL TEMPERATURE (°C)



SALINITY
(PSU)



POTENTIAL
DENSITY



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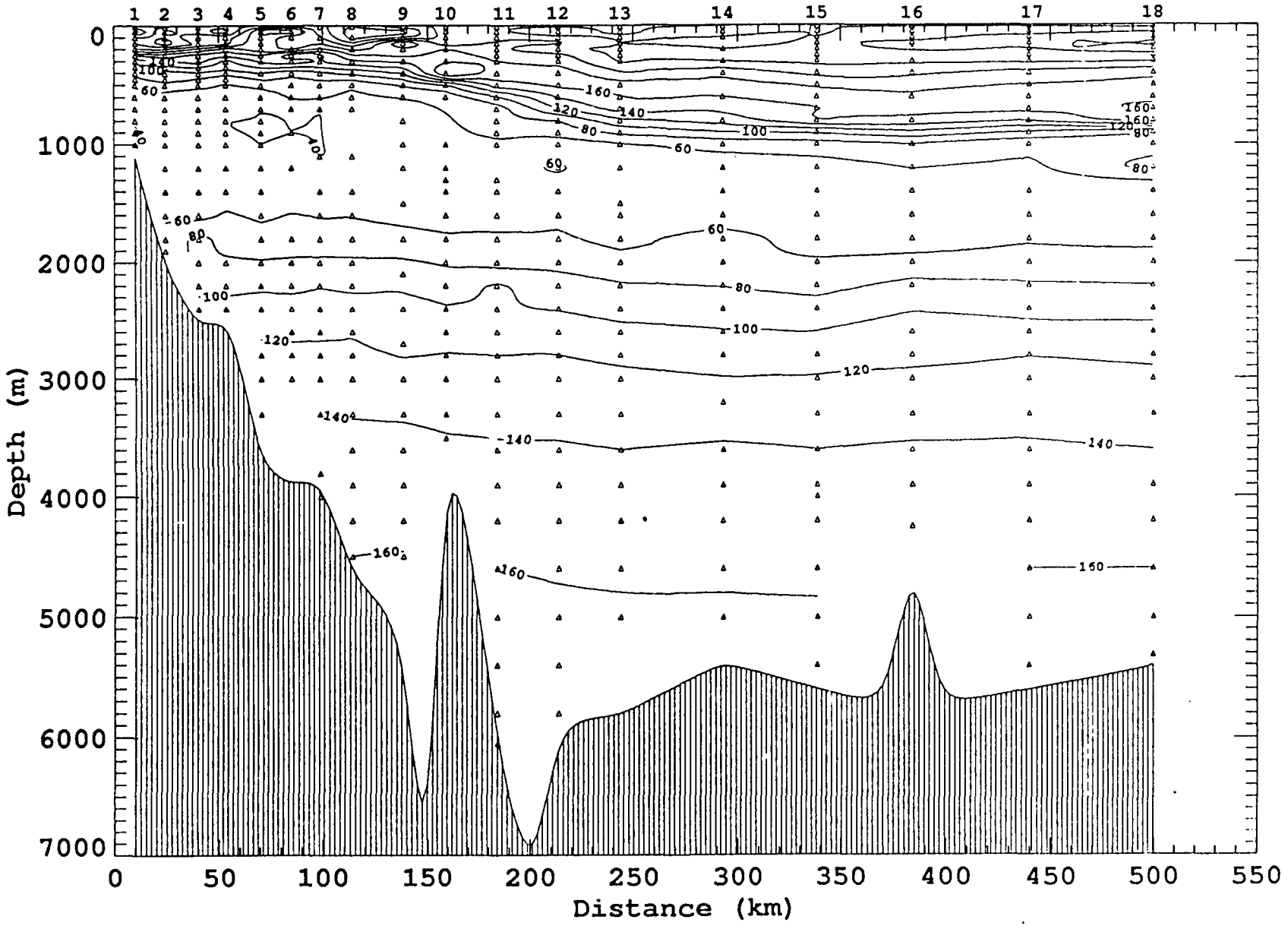
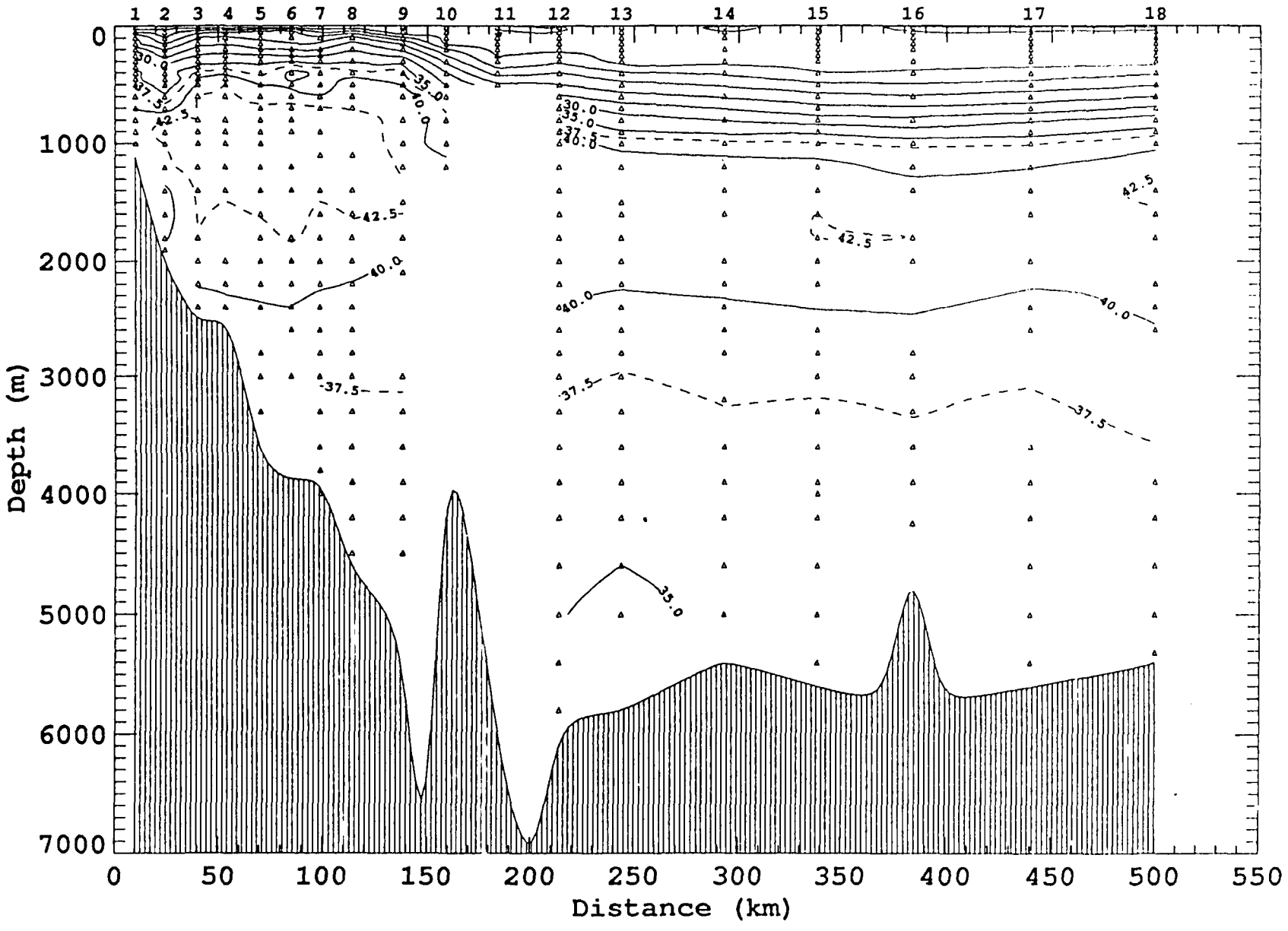
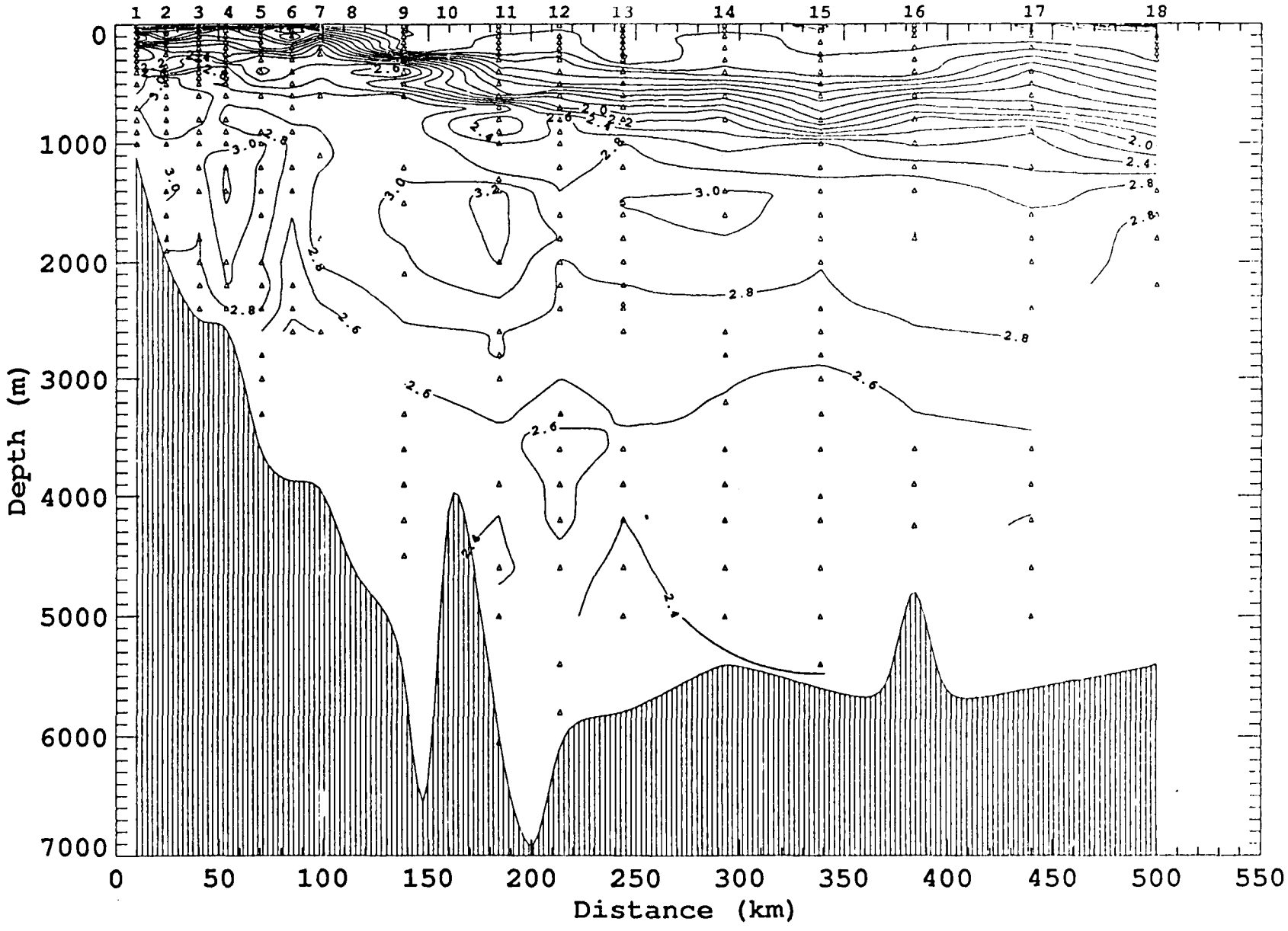
Oxygen
(μmol/kg)



NITRATE
(μmol/kg)



PHOSPHATE
(μmol/kg)



Silica
(μmol/kg)